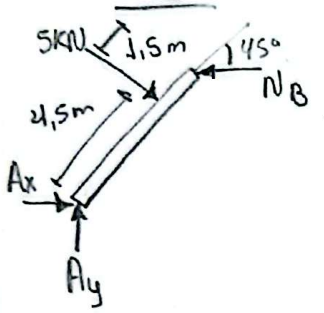
MEC. SOL. I

Atividade 6

01)

DCL



(I) Considerando uma análise global:

$\curvearrowleft + \Sigma M_A = 0$; $N_B \operatorname{sen}45°(6) - 5(4,5) = 0 \therefore$ **$N_B = 5,303$ kN**

(II) P/ seção a-a, temos:

$\Sigma F_{x'} = 0$; $N_{a-a} + 5,303\cos 45 = 0 \therefore$ **$N_{a-a} = -3,75$ kN**

$\Sigma F_{y'} = 0$; $V_{a-a} + 5,303 \operatorname{sen}45 - 5 = 0 \therefore$ **$V_{a-a} = 1,25$ kN**

$\Sigma M_C = 0$; $5,303 \operatorname{sen}45(3) - 5(1,5) - M_{b-b} = 0 \therefore$ **$M_{b-b} = 3,75$ kN.m**

(III) P/ seção b-b:

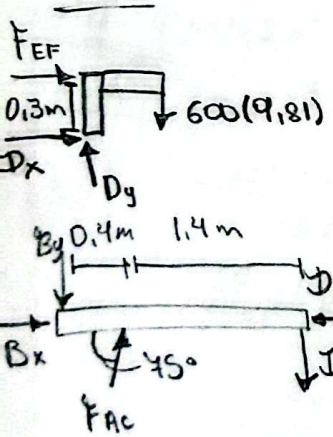
$\Sigma F_x = 0$; $N_{b-b} - 5\cos 45° + 5,303 = 0 \therefore$ **$N_{b-b} = -1,768$ kN**

$\Sigma F_y = 0$; $V_{b-b} - 5\operatorname{sen}45 = 0 \therefore$ **$V_{b-b} = 3,536$ kN**

$\Sigma M_C = 0 \therefore 5,303 \operatorname{sen}45(3) - 5(1,5) - M_{b-b} = 0 \therefore$ **$M_{b-b} = 3,75$ kN**

02)

DCL



$\Sigma M_F = 0$; $D_y(0,3) - 600(9,81)(0,5) = 0 \therefore$ **$D_y = 9810$N**

$\Sigma F_y = 0$; $D_y - 600(9,81) = 0 \therefore$ **$D_y = 5886$N**

* Considerando a barra BD:

$\Sigma M_B = 0$; $F_{AC} \operatorname{sen}75(0,4) - 5886(1,8) = 0 \therefore$ **$F_{AC} = 27421,36$ N**

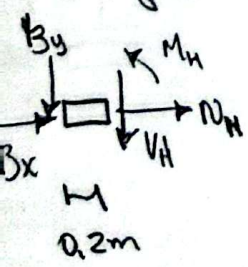
$\Sigma F_x = 0 \therefore B_x + 27421,36\cos 75 - 9810 = 0$

$B_x = 2712,83$ N

$\Sigma F_y = 0 \therefore 27421,36 \operatorname{sen}75 - 5886 - B_y = 0$

$B_y = 20601$N

* Cargas internas:



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03)

* Considerando o membro AB:

$\Sigma M_A = 0 \therefore F_{BC} \cdot \text{sen}(30) \cdot 6 - 20(2) - 20(4) = 0 \therefore \boxed{F_{BC} = 40\,KN}$

$\Sigma F_x = 0 \therefore A_x - 40\cos(30) = 0 \therefore \boxed{A_x = 34,64\,KN}$

$\Sigma F_y = 0 \therefore A_y - 20 - 20 + 40\,\text{sen}\,30° = 0 \therefore \boxed{A_y\ 20\,KN}$

- F. no pino A: $F_A = \sqrt{34,64^2 + 20^2} \boxed{40\,KN}$
- Para os pinos em A e C, ambos tem a mesma carga e cisalhamento duplo, logo:

$V_A = V_B = \frac{40}{2} = 20\,KN$

- Área dos pinos A e C:

$A_A = A_C = \frac{\pi}{4}(0,018^2) = 81\pi \times 10^{-6}\,m^2$

* Logo:

$T_A = T_C = \frac{20 \times 10^3}{81\pi \times 10^{-6}}$

$\therefore \boxed{T_A = 78,6\,MPa}\ \boxed{T_C = 78,6\,MPa}$

04)

* Considerando o diagrama:

$E = \frac{32,2 \times 10^6}{0,01} \therefore \boxed{E = 3,22 \times 10^9\,Pa}$

* Logo...

$\sigma_{AB} = \frac{40 \times 10^3}{\frac{\pi}{4}(0,04)^2} \therefore \boxed{\sigma_{AB} = 31,83\,MPa}$

$\varepsilon_{AB} = \frac{31,83 \times 10^6}{3,22 \times 10^9} \therefore \boxed{\varepsilon_{AB} = 9,885 \times 10^{-3}\,\frac{mm}{mm}}$

$\sigma_{CD} = \frac{40 \times 10^3}{\frac{\pi}{4}(0,08)^2} \therefore \boxed{\sigma_{CD} = 7,958\,MPa}$

$\varepsilon_{CD} = \frac{7,958 \times 10^6}{3,22 \times 10^9} \therefore \boxed{\varepsilon = 2,471 \times 10^{-3}\,\frac{mm}{mm}}$

$\delta_{AB} = 9,885 \times 10^{-3} \times 2000 = \boxed{19,771\,mm}$

$\delta_{CD} = 2,471 \times 10^{-3} \times 500 = \boxed{1,236\,mm}$

$tg\alpha = \frac{19,771 - 1,236}{1500}$

$\therefore \alpha = tg^{-1}\left(\frac{18,535}{1500}\right)$

$\boxed{\alpha = 0,708°}$

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